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Clinical pathways for patients with newly diagnosed hepatitis C – What actually happens

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SUMMARY. Management of hepatitis C virus (HCV)-infected individuals requires referral to specialist care. To determine whether patients newly diagnosed as anti-HCV positive are appropriately referred for further investigation and management, and if not, to determine why not. We studied patients tested for antibodies to HCV by Nottingham Public Health Laboratory in a 2-year period (2000–2002). The progress of newly diagnosed anti-HCV positive patients into specialist clinics for further management was documented. For patients not referred for specialist care, a questionnaire was sent to the clinician requesting the initial anti-HCV test, to identify reasons for nonreferral. Eleven thousand one hundred and seventy-seven patients were tested for anti-HCV. Two hundred and fifty-six (2.3%) were newly diagnosed as being anti-HCV positive. Two per cent of samples sent from primary care were anti-HCV positive, compared to 18.8, 18.9 and 1.3% sent from prison, drug and alcohol units, and secondary care, respectively. About 64.3% of positive patients diagnosed in primary care were referred to specialist care, compared to 18.4, 42.4 and 62.6% of patients diagnosed in the other three settings. One hundred and twenty-five (49%) newly diagnosed patients were referred appropriately for further management. 68 of these attended clinic, 45 underwent liver biopsy and 26 (10%) began treatment. One hundred and thirty-one patients (51%) were not referred. In 54 cases, there was no evidence that the anti-HCV positive result reached the patient. In 15, referral was considered but rejected, and 20 patients were referred to non-HCV-specialists (their general practitioners or to genito-urinary medicine). Hence less than 50% of newly diagnosed anti-HCV positive patients are referred to an appropriate clinic for further investigation and management. Reasons for this are multifarious and complex, reflecting both systems failure and patient choice. Unless these are understood and addressed, the Department of Health Hepatitis C Strategy (2002) and Action Plan for England (2004) will fail to achieve their intended objectives.

Keywords: care pathways, diagnosis and management, hepatitis C virus.

INTRODUCTION

Chronic hepatitis C virus (HCV) infection is recognized as a major global public health problem, with an estimated 170 million carriers worldwide, and of the order of 200 000 carriers in England [1]. This importance is reflected in both *Getting Ahead of the Curve,* the over-arching strategy for combating infectious diseases in the UK released by the Chief Medical Officer in 2002 [2], and in the production by the Department of Health of the documents Hepatitis C Strategy for England, and Hepatitis C Action Plan for England [1,3]. The aims specified in these latter documents include identification of '…those who are chronically infected by increased testing for hepatitis C' and to '…offer specialist advice and appropriate treatment via co-ordinated pathways of patient care'. The philosophy of these documents is that patients with HCV infection should be diagnosed, and that once a positive test result is obtained, patients should be referred on for appropriate investigation and management.

In the UK, the primary diagnostic test for HCV infection is the determination of anti-HCV antibodies in a serum sample. Anti-HCV positivity should logically be followed up by test-

Abbreviations: HCV, hepatitis C virus; PAS, patient administration system.

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ing for the presence of HCV–RNA, but this is often regarded as a specialist test, ordered only once the patient attends secondary care for further investigation and management. In 2001, the Trent HCV Study Group reported that only around 55% of patients diagnosed as being anti-HCV positive in a laboratory in Trent between 1991 and 1998 had been referred to a specialist clinic within Trent for further investigation and management of their HCV infection [4]. Others have shown that even amongst patients who attend clinics in secondary care, there is a considerable dropout from optimal care pathways resulting in very low overall rates of sustained viral clearance, or cure, from HCV infection [5,6]. Unless the reasons for current failures to identify, refer, and appropriately manage patients with chronic HCV infection are fully understood, the aspirations of the HCV Strategy and Action Plan documents will not be achieved. This study therefore set out to quantify patient drop out from each stage of the management pathway from diagnosis to cure and, in particular, to analyse reasons for the nonreferral of individuals identified as anti-HCV positive to appropriate specialist care. We identified all patients newly diagnosed as anti-HCV positive in a 2-year period in the Nottingham Public Health laboratory, and tracked their subsequent progress, using a number of computerized patient record systems, reference to patient hospital records, and questionnaires sent to clinicians who initially requested the patients' anti-HCV tests.

METHODS

We obtained ethical committee approval from Nottingham Research Ethics Committee. We undertook a retrospective cross-sectional study, which involved record linkage from multiple sources.

Subjects, setting and data collection

We identified all serum samples referred to the Public Health Laboratory, Nottingham during a 2-year study period (1st November 2000–31st October 2002) on which anti-HCV testing was performed. We excluded samples sent from other laboratories for confirmatory testing of anti-HCV reactivity. The laboratory serves a population of around 650 000, based on the city of Nottingham but with surrounding rural areas. The age/sex distribution of the catchment area mirrors those of England and Wales, with ethnic minority populations estimated at 15%, slightly above the national average of 9.1% [7].

The following data were extracted from the computerized records for each of the tests: laboratory sample unique ID number, date of sample, sex, initials and date of birth of the patient, source of the referral and the result of the test. We coded the source of referral into five main groups: (i) general practice; (ii) prison; (iii) specialist units for drug and alcohol abuse; (iv) secondary care and (v) miscellaneous (e.g. private screening, research studies). The test result was coded as positive or negative. Indeterminate, equivocal and borderline results were coded as negative.

We used the patient's sex, date of birth and initials to identify unique individual patients. Where an individual was tested by more than one referral source, the data from the first sample was used for the source coding. Samples that could not be linked to an individual patient due to missing data were eliminated from the study.

For each of the patients with an anti-HCV positive result, we searched laboratory databases (established in 1991) of all known anti-HCV and HCV RNA positive samples tested in Nottingham to determine whether he/she had been identified as HCV-infected prior to the study period or not. We also searched the computerized patient administration system (PAS) in Nottingham to determine whether, and if so, when, each patient had been referred, either as an inpatient or outpatient, to a clinician specializing in the investigation and management of HCV infection (defined as a gastroenterologist or infectious diseases physician). For all such patients, clinic notes were reviewed to determine whether the patient attended, and whether an HCV–RNA test was performed, a liver biopsy undertaken, or treatment was initiated.

HCV antibody and RNA testing

Antibodies to HCV were sought using a third generation immunoassay (Ortho Vitros ECI). HCV–RNA was sought using a polymerase chain reaction assay (Roche HCV Amplicor 3.0).

Questionnaire to referral source

For anti-HCV positive patients who had no evidence of being referred to an appropriate specialist clinic between 1st November 2000 and 30th April 2003 (thus extending the observation period for 6 months after the last patient in our cohort would have been tested), we sent a questionnaire to the clinician who requested the anti-HCV test, asking four main questions – (i) was the result of the anti-HCV test received? (ii) was a test for HCV–RNA performed? (iii) was the patient referred on for further care, and if so, where? (iv) if the patient was not referred, then why not? Nonresponders were re-mailed after 8 weeks. A researcher (SS) visited the clinic or general practice in order to help with data extraction where help was requested.

Statistical analysis

Unadjusted odds ratios were calculated using binary logistic regression (SPSS Version 11.0) to compare the characteristics (age, sex and source of referral) of patients who had a new anti-HCV positive result with those who were negative. The same type of analysis was carried out for patients who were referred to secondary care compared with those who were not.

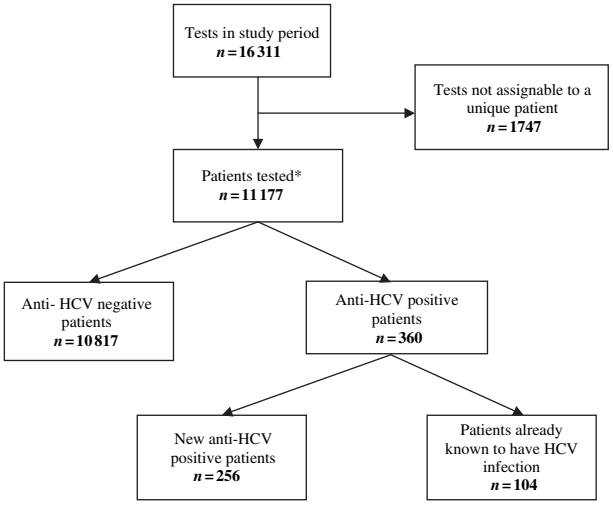


Fig. 1 Flow chart of anti-HCV testing through the study. *Note that some patients were tested on multiple occasions during the study period.

A multivariable logistic regression analysis for each outcome was also carried out including age, sex and source of referral in the model to identify the independent effect of each of these characteristics.

RESULTS

Anti-HCV testing

There were 16 311 anti-HCV tests meeting our study criteria performed in the 2-year study period. We identified 11 177 unique patients, who had received 14 564 tests (some patients were tested more than once). There were 1747 HCV tests which could not be assigned to a unique patient due to lack of one or more patient identifiers (sex, initials, date of birth).

Of the 11 177 patients tested, 360 were anti-HCV positive (Fig. 1). Reference to laboratory-held databases of all known anti-HCV and HCV–RNA positive samples tested in Nottingham, and also to the Nottingham PAS, identified 104 of these patients in whom either the diagnosis of HCV infection, and/or referral to appropriate specialist care, had been made prior to the date of the study anti-HCV positive sample, thus leaving 256 patients (2.3% of 11 073) in whom a new diagnosis of anti-HCV positivity was made during the study period. For 56 (21.8%) of these patients, the source of the antibody request was general practice, 38 (14.8%) came from prisons, 61 (23.8%) from specialist units for drug and alcohol misuse, and 101 (39.4%) from secondary care, 20 of whom were patients attending a genitourinary medicine clinic.

Table 1 compares the characteristics of the 256 patients newly identified as anti-HCV positive with the 10 817 patients who had a negative anti-HCV result. Positive results were significantly more likely in males (3.0%) than females (1.3%, $P = 0.001$), and in patients aged 25–44 (4.5%, $P = 0.05$ compared to patients aged 0–15). With respect to referral source, samples sent from specialist units for drugs and alcohol or from a prison source were significantly more likely to be positive than those sent from primary or secondary care (positivity rates 18.9 and 18.8%, compared to 2.0 and 1.3%, respectively, $P = 0.001$). In the adjusted analysis, age was no longer a significant factor.

Referral of anti-HCV positive patients

Ninety-six (37.5%) of the 256 newly diagnosed anti-HCV positive patients were identified in the Nottingham PAS as having been referred to appropriate specialist care, subsequent to the date of HCV diagnosis, and a further 11 patients were noted to have died. Questionnaires were therefore sent to the source of the initial test request for the remaining 149 anti-HCV positive patients, for whom no evidence of appropriate referral to specialist care could be traced. Replies were received for 112 patients (75.2%) on the first mailing, increasing to 125 (83.9%) with a second mailing.

Anti-HCV positive patients who were not referred ($n = 131$)

After taking account of the questionnaire responses, we could not identify any evidence of referral for 131 (51.2%) of the 256 newly diagnosed HCV-infected patients. Table 2 shows that patients who were over 45 years of age were more likely to be referred than younger patients and male patients were less likely to be referred than female patients, but these did not reach statistical significance. However, the source of the original test was strongly associated with referral rates. Only 18.4% ($P = 0.001$) of patients originating in prison, and 42.6% ($P = 0.01$) of patients from specialist drug and alcohol units were referred, compared to 66.1 and 54.5% of those originating in general practice or secondary care, respectively. These differences remained significant in the adjusted analysis.

Of the 131 patients not referred, 11 had died (and therefore we did not send a questionnaire), and for 24, the original requester of the anti-HCV test did not return our questionnaire. The reasons provided in the 96 returned questionnaires as to why these patients were not referred to a specialist for further management of their HCV infection are grouped together in Table 3 as follows:

Group (1) – 54 patients for whom, for a variety of reasons, we have no evidence that the patient was ever informed of their anti-HCV positive status.

Group (2) – 15 patients for whom referral was clearly considered as an option, but not adopted. This included five patients who were tested and shown to be HCV–RNA negative.

Table 1 Characteristics of anti-HCV positive patients

		Odds ratio (95% CI)		
	No. anti-HCV positive*	Unadjusted	Adjusted†	Significance†
Age group				
0–15	5/266 (1.9)	1.00	1.00	
16–24	27/811 (3.3)	1.80 (0.69–4.72)	0.70 (0.25–1.88)	0.47
25–44	162/3616 (4.5)	2.45 (0.99–6.02)	1.50 (0.60–3.75)	0.38
45+	49/5747 (0.9)	0.45 (0.18–1.14)	0.42 (0.17–1.08)	0.07
Missing	13/620 (2.1)			
Sex				
Females	64/4878 (1.3)	1.00	1.00	
Males	187/6146 (3.0)	2.36 (1.77–3.14)	1.72 (1.26–2.35)	0.001
Missing	5/49 (10.2)			
Source of referral				
General practice	56/2832 (2.0)	1.00	1.00	
Prisons	38/202 (18.8)	11.49 (7.39–17.85)	7.07 (4.35–11.51)	0.001
Drug and alcohol units	61/323 (18.9)	11.54 (7.86–16.95)	9.59 (6.31–14.57)	0.001
Secondary care	101/7646 (1.3)	0.66 (0.48–0.92)	0.9 (0.64–1.28)	0.56
Miscellaneous	0/70 (0.0)			
Group total	256/11073 (2.3)			

HCV, hepatitis C virus; CI, confidence interval.
*Number of anti-HCV positive patients/Total number tested (percentage).
†The adjusted analysis includes all three variables, age, sex and source of referral.

Table 2 Characteristics of anti-HCV positive patients referred for specialist care

		Odds ratio (95% CI)		
	No. patients referred*	Unadjusted	Adjusted†	Significance†
Age group				
0–15	2/5 (40.0)	1.00	1.00	
16–24	11/27 (40.7)	1.03 (0.15–7.23)	1.29 (0.17–9.59)	0.80
25–44	72/162 (44.4)	1.20 (0.20–7.38)	1.64 (0.26–10.43)	0.60
45+	33/49 (67.3)	3.10 (0.47–20.40)	3.13 (0.46–21.40)	0.25
Missing	7/13 (53.8)			
Sex				
Females	37/64 (57.8)	1.00	1.00	
Males	88/187 (47.1)	0.65 (0.37–1.15)	0.83 (0.43–1.58)	0.56
Missing	0/5 (0.0)			
Source of referral				
General practice	37/56 (66.1)	1.00	1.00	
Prisons	7/38 (18.4)	0.12 (0.04–0.31)	0.10 (0.03–0.32)	0.001
Drug and alcohol units	26/61 (42.6)	0.38 (0.18–0.81)	0.44 (0.19–0.99)	0.05
Secondary care	55/101 (54.5)	0.61 (0.31–1.21)	0.59 (0.29–1.24)	0.16
Group total	125/256 (48.8)			

HCV, hepatitis C virus; CI, confidence interval.
*Number of anti-HCV positive patients referred/total number anti-HCV positive patients (percentage).
†The adjusted analysis includes all three variables, age, sex and source of referral.

Table 3 Reasons for nonreferral to specialist care

Reason for nonreferral	Number
Group 1 (no evidence that patient made aware of HCV status)	
Anti-HCV result not received	11
Patient not known	4
Patient didn't attend for follow up consultation	12
Patient transferred/released from prison	23
Patient no longer in referring practice	4
Total	54
Group 2 (referral considered but not performed)	
Referral was offered but the patient declined	3
Referral was not clinically indicated	6*
Patient was unsuitable for referral	2
Patient assumed to be under appropriate care	1
HCV infection being treated elsewhere	3
Total	15
Group 3 (referral to nonspecialist)	
Patient referred to GP	17†
Patient referred to genito-urinary medicine	3
Total	20
No reason given	7
Total of nonreferrals	96

HCV, hepatitis C virus.
*Five patients HCV–RNA negative and 1 'patient well'.
†All from specialist drug and alcohol units.

Group (3) – 20 patients who were referred, but not to a specialist in the management of HCV infection.

For seven patients, no reason for nonreferral was given.

ANTI-HCV POSITIVE PATIENTS WHO WERE REFERRED ($N = 125$)

Questionnaire responses identified a further 29 patients who had apparently been referred, in addition to the 96 we identified in the Nottingham PAS, making a total of 125 patients (48.8%) referred (Fig. 2). However, for 17 of these, we were unable to obtain any further information – 11 were patients originally tested in the genito-urinary medicine clinic and their details were therefore not available to us to track, and the remaining six were referred to hospitals outside the Nottingham area. There were 12 patients where referral to an appropriate clinic in Nottingham was said to have occurred, but no record of this referral could be identified in the relevant clinics (Fig. 2).

Of the 96 patients with a confirmed referral to specialist secondary care in Nottingham, 68 (70.8%) have attended clinic whilst 28 (29.2%) have not. The age and sex characteristics of the nonattenders did not differ from those of the attenders. However, whilst only 9/19 (47.4%) patients confirmed as referred from specialist drug and alcohol units attended clinic, corresponding figures for patients originating from general practice, prison or police, or secondary care were 25/32 (78.1%), 5/5 (100%), and 29/39 (74.4%), respectively ($\chi^2 = 9.6$, 3 d.f., $P = 0.024$) (one patient was discharged prior to a clinic appointment being made, and although included in the nonattenders group, is not considered in this analysis).

Hepatitis C virus RNA testing was requested for 65 of the 68 attenders. Figure 3 shows the progress of these patients. Fifty-five (84.6%) were HCV–RNA positive, 43 of whom (78.2%) underwent a liver biopsy (an additional two biopsies were performed in HCV–RNA negative individuals with abnormal liver function tests). In seven patients, biopsy was not performed, as therapy was not considered appropriate, whilst three patients defaulted from clinic before a biopsy was discussed. Treatment was initiated for 26 patients. The origin of the treated patients in terms of referral source is given in Table 4. About 21.4% (12/56) of patients tested initially by their GPs completed the management pathway through to therapy, compared to 7.9% (3/38), 1.6% (1/61) and 9.9% (10/101) of patients initially tested in prison, specialist drug

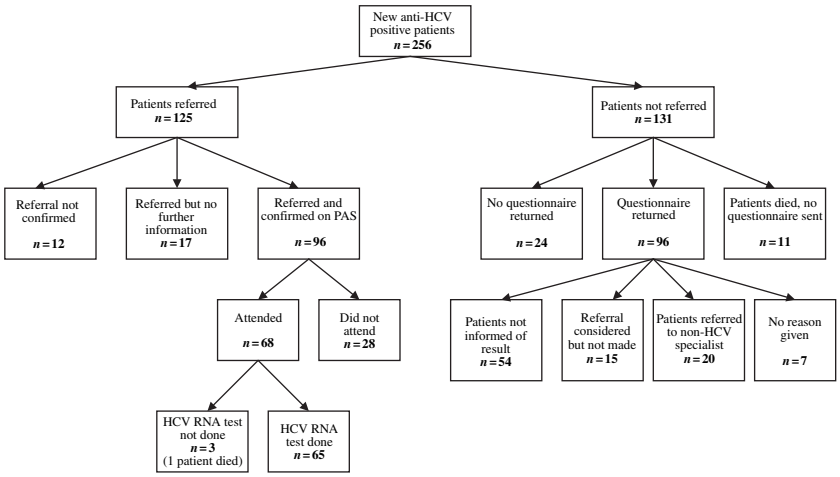


Fig. 2 Progress of new anti-HCV positive patients.

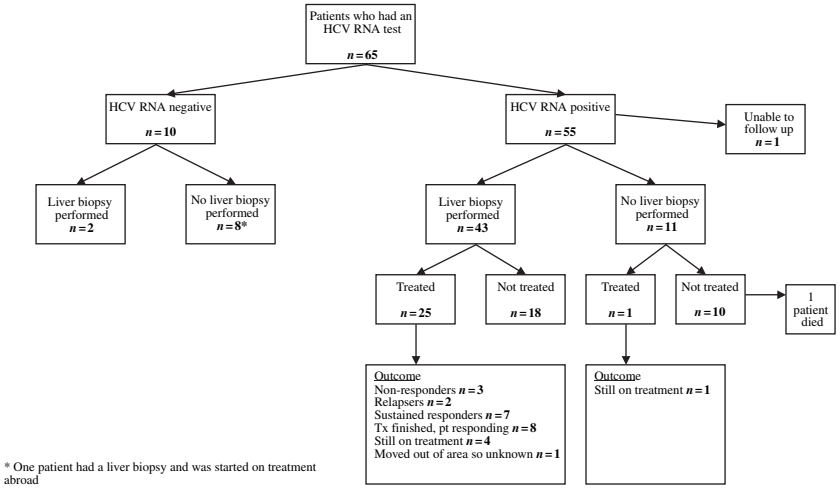


Fig. 3 Progress of patients who had an HCV–RNA test.

Table 4 Relationship between the source of the original test request and subsequent management of anti-HCV positive patients

Source of test request	Number of anti-HCV positives	Number referred to secondary care (%)†	Number confirmed as referred (%)†	Number attended (%)†	Number treated (%)†,*
General practice	56	37 (66.1)	32 (57.1)	25 (44.6)	12 (21.4)
Prison	38	7 (18.4)	5 (13.2)	5 (13.2)	3 (7.9)
Specialist units for D&A misuse	61	26 (42.6)	20‡ (32.8)	9 (14.8)	1 (1.6)
Secondary care	101	55 (54.5)	39 (38.6)	29 (28.7)	10 (9.9)
Group total	256	125 (48.8)	96 (37.5)	68 (26.6)	26 (10.2)

HCV, hepatitis C virus.
*Comparing proportions treated out of total, $P = 0.005$.
†Percentage of corresponding number of anti-HCV positives.
‡Including one patient who was referred but discharged prior to a clinic appointment being made.

and alcohol units, and secondary care, respectively ($\chi^2 = 12.9$, 3 d.f., $P = 0.005$)

Anti-HCV positive patients who died during the study period (n = 13)

Thirteen (5.1%) of the 256 newly diagnosed anti-HCV-positive patients died during the study period, only two of whom had been referred to an appropriate clinic for assessment of their HCV infection before they died. Twelve (92.3%) were male. The median age of the patients was 46 years (range: 31–82). Eleven patients were initially tested for anti-HCV whilst in secondary care, the remaining two being tested at a specialist drug and alcohol unit. The median time between the initial anti-HCV test and the date of death was 62 days (range: 2–983). Three of the patients died of liver disease, two of whom presented with complications of end-stage liver disease, at which point the diagnosis of HCV infection was made. In the remaining 10 patients, HCV was not implicated in the cause of death, although four died of complications associated with injecting drug abuse.

DISCUSSION

The rate of referral of anti-HCV positive patients for appropriate specialist investigation and management identified in our 2-year study period (2000–2002) was less than 50%, a figure similar to that reported by the Trent Group (55%) for patients diagnosed in Trent region between 1991–1998 [4]. The rate of attendance of referred patients was also low (68/96, 71%), further exacerbating the problem. Our analysis suggests that the reasons for these alarmingly low rates of onward referral and management are multifarious and complex, reflecting both systems failure and patient choice.

The analysis presented herein is based on the assumption that it is appropriate for all anti-HCV positive patients to be referred to a specialist for further investigation and management. This is indeed explicitly stated as an underlying philosophy in the HCV Strategy document issued by the Department of Health in the UK [1]. This is true even for patients who may inform their primary care provider that they are not interested in undergoing liver biopsy or therapy, as specialists are better placed to conduct informed discus-

sions surrounding these issues, and to advise on harm reduction strategies. The one exception is for those anti-HCV positive patients who are HCV–RNA negative, at least 20% of such individuals. Provided liver function tests are normal, liver biopsy or antiviral therapy would not be indicated. It would be efficient for laboratories to perform HCV–RNA testing at the time the first anti-HCV positive result is generated, but genome detection tests are expensive and contracting arrangements may preclude laboratory initiation of such tests.

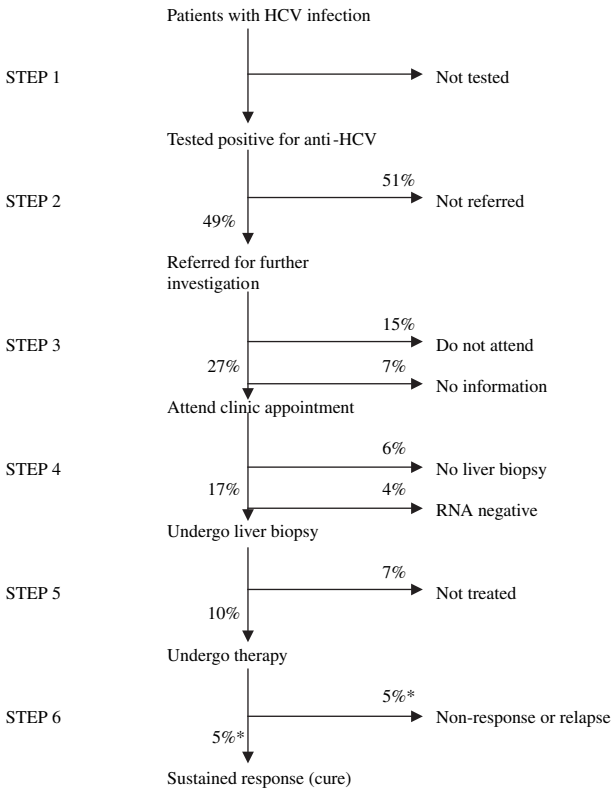
Injecting drug use is the commonest risk factor for HCV infection, and it is therefore not surprising that we found the highest test positivity rate (18.9%) in patients tested by specialist drug and alcohol units. Of the 61 patients originating from this source, we were able to confirm referral to appropriate specialist care for only 20 (33%, Table 2). A sizeable number of these patients are referred instead to their primary care physicians (Table 4), but we found no evidence that onward referral from primary to secondary care then took place. It is conceivable that HCV infection is not perceived by these patients or their carers as a major priority at the time of first diagnosis. Possibly these patients will re-enter the management pathway at a later date, when their addiction and psychosocial problems have improved or their physical health has changed. Amongst the 19 who were definitely referred, 9 (47%) subsequently attended a clinic appointment, only 1 (11.1%) of whom underwent therapy, significantly lower rates than for patients referred from all other sources. This may arise from the chaotic lifestyle of drug and alcohol users, or reflect the lower priority they, or their medical care providers, give to HCV treatment compared with their drug seeking behaviour. Given that the overwhelming majority of patients with HCV infection in the UK are, or have been, injecting drug users, there is clearly a need for innovative multidisciplinary approaches to the concurrent management of the addiction and infection problems arising in this population group.

A considerable proportion of prisoners have a history of injecting drug use, and prisoners therefore also represent a high risk group for HCV infection [8], consistent with the high rate of positive test results from this source in this study (18.8%). This group also represent a significant opportunity for intervention as they are literally a captive population and may be more amenable to treatment as they may be less likely to be using illegal drugs in prison. It is clear from our results – only 18.4% of anti-HCV positive prisoners were referred to secondary care – that this opportunity is not being taken. There are a number of reasons why anti-HCV positive prisoners may not enter the usual assessment and treatment pathways. Test results may not be communicated directly to the individual prisoner or clinician who requested the test. Prisoners are frequently transferred between prisons or released before HCV results are received or actioned. This is particularly the case for prisoners on remand. Inmate medical records, which should follow the prisoner on transfer may on occasions not do so or may not include the HCV result. Access to secondary care is also influenced by security implications. Released prisoners who are HCV positive may enter temporary accommodation or be released to distant parts of the country inhibiting continuity of care. The difficulties associated with adequate management of HCV infection in prisoners in the UK have been discussed in detail by others [9].

This study does show that where prisoners were confirmed as being referred for specialist assessment, 100% attendance was achieved, which was higher than that from other referral sources. Prisons thus have a high prevalence of HCV infection, a low referral rate to specialist care but a high attendance rate of those referred. Addressing these prison healthcare issues will be crucial in achieving the goals of the national HCV strategy. One option would be to postpone inter-prison transfers of inmates until the results of any HCV tests performed on them are known by the prison medical officer, communicated to the prisoners concerned, and management plans agreed.

This study has identified a range of systems errors that mitigate against proper care for HCV-infected individuals. Altogether, we documented 54 instances (21% of all newly diagnosed HCV infections) where it appeared that the anti-HCV positive result was never communicated to the patient concerned (Table 3). For a further 12 patients, the requesting clinician was under the impression that an appropriate referral had been made to one of the two specialist HCV clinics in Nottingham, but extensive searching of clinic records failed to find any evidence that the referral letter had been received (Fig. 2). Traditional public health methodology and services could have a major effect on these damning statistics. Protocols are well established for other communicable diseases, which have important implications for public health. We would argue that a similar approach should be devised for hepatitis C, to ensure that results of particular importance to both the patient and the public health are properly communicated to, and acted upon by the correct individual who knows and has direct contact with the patient.

Although models of delivery of healthcare vary markedly in different countries, there is evidence that the problems we have identified are not unique to the UK. Lack of knowledge amongst primary care physicians of recommended guidelines for the management of HCV-infected patients has been reported in studies conducted in Turkey and the USA [10,11], and such deficiencies have been shown to contribute to lower than recommended rates of therapy [12]. A recent report in the context of implementation of guidelines for HBV-infected patients suggests that improved education of and communication with primary care physicians can result in better rates of adherence to guidelines [13]. However, it should be emphasized that in our study, across the four-referral sources, patients tested by their general practitioners achieved the best outcomes in terms of specialist referral, attendance and treatment (Table 4).



% are calculated from the data in this study except for Step 6, where the figures (*) are estimated on the basis of 50% sustained response rates to therapy [14]

Fig. 4 Care pathway for patients with HCV infection.

The potential consequences of untreated end-stage HCV-associated liver disease are illustrated by the two patients who presented during the study period with complications of undiagnosed end-stage liver disease, both of whom died before appropriate therapy for their HCV infection could be instituted.

In summary, a care pathway for the management of HCV infection is presented in Fig. 4. Patients drop out of this pathway at all junctures, and an understanding of the reasons for dropout is essential if strategies are to be devised to achieve maximal yield from patients entering with HCV infection at the top and emerging cured of their infection at the bottom. This study has not addressed step 1, which requires that patients come forward for testing, and/or their clinicians consider a diagnosis of HCV infection. However, we have identified a wide range of reasons for patient dropout, and present a simplified quantification for the relative fallout at steps 2–6. In the light of these data, it will be possible to plan and test the efficacy of innovative interventions designed to improve patient throughput.

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